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November 18, 2019

Matthew Hebert, Executive Director Springbank
Alberta Transportation
Twin Atria Building, First Floor
4999-98 Avenue
Edmonton, AB T6B 2X3

Dear Mr. Hebert:

Re: Alberta Transportation Proposed Springbank Off-Stream Reservoir Project
NRCB Application No. 1701
Water Act No. 00387101

In support of the *Water Act* (WA) Application No. 00387101 and the Natural Resources Conservation Board (NRCB) Application No. 1701 Alberta Environment and Parks and associated government agencies have reviewed the Environmental Impact Assessment (EIA) report received on October 2017 and March 2018 and Supplemental Information Request Responses received on June 14, 2019.

We require the following Supplemental Information, as outlined in the enclosure, to complete our evaluation of the EIA report. Upon review of all the information submitted, a final determination will be made on the completeness of the EIA report.

Sincerely,

Heather Dent
Senior Manager, Assessment and Continuations
Provincial Programs
(Designated Director, *Environmental Protection and Enhancement Act*)

cc: Laura Friend (NRCB)
Jennifer Howe (CEAA)
Wendy Unfreed (Culture and Tourism)
Laurie Cheperdak (Health)
Kevin Wilkinson (AEP)
Melanie Daneluk (AEP)

Water Act File No. 387101
NRCB Application No. 1701

Table of Contents

Acronyms

The following acronyms are used in this Supplemental Information Request.

AAAQO	Alberta Ambient Air Quality Objective
AEP	Alberta Environment and Parks
BOD	biochemical oxygen demand
CEAA	Canadian Environmental Assessment Agency
COPC	chemicals of potential concern
DEM	digital elevation model
DEP	diesel exhaust particulate
DO	dissolved oxygen
ECCC	Environment Climate Change Canada
EIA	environmental impact assessment
ENFOR	Enforcement Occurrence Record
ER	exposure ratio
FWMIS	Fisheries and Wildlife Management Information System
GOA	Government of Alberta
ha	hectare
HHRA	human health risk assessment
km	kilometre
KWBZ	key wildlife and biodiversity zone
LAA	local assessment area
m	metre
mm	millimetre
m/s	metres per second
MC1	McLean Creek
PDA	project development area
RAA	regional assessment area
RFDAM	Rapid Flood Damage Assessment Model
SIR	Supplemental Information Request
SOMC	species of management concern
SR1	Springbank Off-stream Reservoir
TDP	total dissolved phosphate
TDR	technical data report
TGP	total gas pressure
TRV	toxicological reference value
TSS	total suspended solids
TUS	Traditional Use Study
WMU	wildlife management units
ZREC	reclaimed land

1 Natural Resources Conservation Board

The responses to questions in Section 1 will not be considered as part of the EIA completeness decision made by Alberta Environment and Parks.

1. CEAA letter to AT, July 16, 2019, Overarching issues, 5, Page 2

CEAA states *while data from submissions from engagement with Indigenous groups is presented as discrete pieces of information, the analysis of this information requested by the Agency is not included in the response….[T]he Agency requested that Alberta Transportation present the input obtained from Indigenous groups, including a description of how that input was integrated into the responses for all information request items relating to effects of changes to the environment on Indigenous peoples (CEAA 2012 section 5(1)(c)) and potential impacts to Aboriginal and treaty rights. Additionally, the Agency indicated that points of disagreement between the views of Alberta Transportation and Indigenous groups should be presented, along with a description of efforts undertaken to reconcile these differences and a rationale for conclusions.*

a. Provide the information obtained from Indigenous groups. Include a description of the environmental effects of the project on Indigenous peoples and the potential impacts to Aboriginal and treaty rights.

b. Provide details on points of disagreement on potential issues between Alberta Transportation and Indigenous groups, including descriptions of efforts undertaken to reconcile these differences and the rationale for the conclusions made.

2. Supplemental Information Request 1, Question 14, Pages 2.22-2.23
Supplemental Information Request 1, Question 15, Page 2.24

Alberta Transportation states that the *Interim Design Report is still in draft as engineering investigation and designs are in the process of being advanced; therefore, it is not being provided. The finalized design report will be made available once complete.*

a. Provide the stamped, signed version of the report titled "Springbank Off-Stream Storage Project Interim Design Report" (Stantec Consulting Ltd. 2017b.).

3. Supplemental Information Request 1, Question 30, Pages 2.48-2.49
Supplemental Information Request 1, Appendix IR6-1, Page 5

Alberta Transportation states that *The utility of using a benefit/cost analysis to compare SR1 to the preliminary cost estimates for the MC1 Option is questionable. Not only do they continue to diverge in terms of the detail and confidence in cost estimates, but challenges arise in attempting to align the two projects for a fair benefit/cost comparison.*

As described in Appendix IR6-1, it is unrealistic to align SR1 and the MC1 Option with a common start year because there are five years of costs to date for SR1, and the costs include environmental assessment costs and the regulatory review process.

a. Describe the weight placed on the benefit/cost analysis for MC1/SR1 in selecting SR1 (or rejecting MC1). If the benefit/cost analysis was not used in the site selection criteria explain why.

b. Comment on whether the updated benefit/cost analysis conducted in 2019 changes Alberta Transportation's assessment of site selection between SR1 and MC1 from a benefit cost perspective.

c. Provide the five reports listed in the page 5 footnotes of Appendix IR6-1.

4. Volume 4, Appendix E, Attachment 3A Section 3A.3.3, Equation 3A.7, Page 3A.32
Section 3A.3.4, Equation 3A.10, Page 3A.39
Section 3A.3.6, Equation 3A.16, Page 3A.57

Volume 4, Appendix G, TDR, Attachment C, C.4, Table C-17, Pages C.67 to C.69
Supplemental Information Request 1, Question 16, Table IR16-2, Page 2.28
Soil silt content used in calculating emission rates are 6.9% to 8.5%, which are based on referenced numbers (Appendix E), while silt content of soils at the project site range from 14% to 66% (Appendix G, Table C-17).

a. Recalculate emission factors in equations 3A.7, 3A.10 and 3A.16 using the silt content of soil at the project site.

b. Update Table IR16-2, with the recalculated emission factors and any other related emission rate assessments in the EIA.

5. Supplemental Information Request 1, Question 42, Page 2.66
Supplemental Information Request 1, Appendix IR42-1, Figures 3-8, 3-10, and 3-12, Pages 3.15, 3.19, and 3.23
Figures 3-8, 3-10 and 3-12 in Appendix IR42-1 show isopach maps for glacial till, glaciolacustrine, and recent fluvial deposits. Contour labels are not shown for all areas in the expanded RAA and it is not obvious what they are.

a. Provide the missing labels for the isopach contours in the expanded RAA.

6. Supplemental Information Request 1, Question 42, Page 2.66
Supplemental Information Request 1, Appendix IR42-1, Figures 3-4 to 3-12, Pages 3.6 to 3.23, and Figures 4-5 to 4-11, Pages 4.9 to 4.12.
Alberta Transportation used a mathematical model to depict the subsurface geologic setting and associated physical parameters that govern the flow of groundwater through porous media. Alberta Transportation states *the effects of fractures are not implemented explicitly using a numerical solution, [but] the numerical model accounts for increased permeability due to the bedrock fractures by including a higher hydraulic conductivity layer.*

Appendix IR42-1, Figures 4-5 to 4-11, depict spatially variable hydraulic conductivities that were assigned to the model layers, depending on the geologic materials represented in that layer.

a. Provide justification for the one order of magnitude difference in hydraulic conductivities between the upper portion of the fractured bedrock and the lower bedrock, as no monitoring wells were completed within the fractured bedrock.

7. Supplemental Information Request 1, Question 42, Page 2.66
Supplemental Information Request 1, Appendix IR42-1, Figures 3-24, 3-25, and 3-26, Pages 3.50 to 3.52, and Table 2-1, Page 2.7

Alberta Transportation provides hydrographs of monitoring wells that were completed in unconsolidated deposits and bedrock in Figures 3-24, 3-25 and 3-26. There are inconsistencies between these figures and the monitoring wells are shown to have pressure transducers installed in Table 2-1.

The hydrograph for monitoring well MW16-8-19 is repeated several times in Figure 3-26. Table 2-1 shows that pressure transducers were installed in MW16-15-34, MW16-7-5 and MW16-18-6 and these are not shown in the referenced figures. Figure 3-24 includes a hydrograph for monitoring well MW16-17-5, however Table 2-1 shows that no pressure transducer was installed.

a. Provide the hydrographs of monitoring wells MW16-15-34, MW16-7-5 and MW16-18- 6. In addition, clarify whether a pressure transducer was installed at MW16-17-5. If no transducer was installed at MW16-17-5 then correct and update the document.

8. Supplemental Information Request 1, Question 42, Page 2.66
Supplemental Information Request 1, Appendix IR42-1, Section 5 and Figure 5-13, Page 5.1 to 5.26

Appendix IR42-1, Section 5 summarizes the predicted effects of the project on water levels. Appendix IR42-1, Figure 5-13 displays simulated head increase up to 24m in the reservoir, yet after timestep 650 there is less than 0.5m of head increase adjacent to the reservoir.

a. Confirm the elapsed time associated with timestep 650.

b. Discuss why is there no propagation of drawdown away from the reservoir in Figure 5- 13. Comment on whether the lack of drawdown has been validated by approximating the problem with an analytical solution.

c. Discuss whether the settings that control the behavior of the phreatic surface are adversely affecting the simulated response to flooding.

9. Supplemental Information Request 1, Question 258, Page 5.57
Supplemental Information Request 1, Appendix IR42-1, Figure 5-4, Page 5.7

No time series plots are provided for the Points of Interest in Appendix IR42-1, Figure 5-4.

a. Provide the plots requested in Question 258.

10. Response to CEAA IR, Package 3, Response IR3-17c, Page 68

Alberta Transportation states *given the intent of the model is to examine potential Project effects, it is not necessary to apply a variable recharge rate since it would not materially affect the net change in head when comparing pre-Project to post-Project conditions.*

a. Explain whether the effects of the off-stream reservoir can be evaluated adequately without changing the areal recharge rate.

11. Supplemental Information Request 1, Question 253, Page 5.52
Supplemental Information Request 1, Appendix IR42-1, Section 2.2, Page 2.2, Section 4.4.1, Page 4.13, and Section 4.4.2, Page 4.20

Appendix IR42-1 describes the use of several types of specified head and specified flux boundary conditions. In section 4.4.1 of Appendix IR42-1 Alberta Transportation describes the use of specified hydraulic head boundaries *set within all model layers around the perimeter of the model domain*. Section 4.4.2 describes the assignment of a specified flux to the top slice of the numerical model to simulate recharge. In Appendix IR42-1, Section 2.2 describes the selection of the RAA boundaries to coincide with surface and groundwater flow divides in many parts of the model.

a. Groundwater flow divides represent areas of zero horizontal groundwater flux. Provide the rationale for applying specified hydraulic heads (a potentially infinite source/sink of water) to areas that are interpreted to be groundwater flow divides.

b. Provide detail on how the aerial recharge and specified head boundaries interact in each area of the model. Provide a steady state flow budget summarizing the flux at all model boundaries and showing the net water balance. Separate the surficial sediments from the bedrock boundaries in the flow budget.

c. Clarify whether the extensive use of specified hydraulic heads limits the capacity of the model to properly calibrate hydraulic conductivity and recharge. Provide details of the model sensitivity to the adjustable parameters including a table showing the local sensitivity of parameter values to steady state calibration data.

d. Comment whether the specified hydraulic heads around the model boundary in each layer affect the forward predictions of change in head during flooding. Provide a table or graph of the boundary conditions over time during the design flood event.

12. Supplemental Information Request 1, Question 56, Table IR56-1, Page 2.85

Alberta Transportation provided Table IR56-1 *Summary of Mean Peak Monthly Flow for Bragg Creek and Sarcee Bridge (1979-2016)*. Mean peak flows during the spring (April, May, and June) appear to be greater at Sarcee Bridge relative to at Bragg Creek (approximately 20%).

a. Provide an analysis of what this information provides in understanding the dynamics of flow (e.g., spring runoff, catchment areas, and storm events/floods, etc.) within the Elbow River and Elbow River watershed, particularly during May and June.

b. Describe how this information may affect specifics related to Project location, design, and to meet the purpose of the Project, including the modelling.

13. Supplemental Information Request 1, Question 59, Page 2.91

Alberta Transportation states that *runoff simulations for the tributaries were modelled for contributions to the diversion channel and reservoir without diversion operations. A 1 :10 year, 24-hour rain event was used to develop flow and stage hydrographs and asses peak inflow into the outlet structure. During this event, the maximum flow rate from the reservoir is 13.3 m^3/s.*

a. Clarify in detail if similar percentage contributions from tributaries are to be diverted into the reservoir for the design flood and 1:100 year flood, and if these volumes were considered in designing the size/capacity of the reservoir (e.g., 13.3 m^3/s from the tributaries in a 1:10 year flood without diversion and a maximum diversion rate

from the Elbow River for a 1:10 year flood is approximately 40 m^3/s, for a resulting total inflow to the reservoir of 53.3 m^3/s).

14. Supplemental Information Request 1, Question 62, Pages 2.97-2.98

Alberta Transportation states *these reductions will also have a positive effect on natural features (e.g., soils, vegetation, wildlife) downstream of the Project by the substantial reduction of adverse effects relative to flood without the Project: the Project will reduce the disturbance and/or destruction of riparian and adjoining areas along Elbow River, while still allowing flood flows of 160 m^3/s that will maintain river ecological functions.*

a. Explain why reducing changes caused by flooding on natural ecological (e.g., scouring) and geomorphic (e.g., altering river dynamics and bedload transport) processes are considered positive in direction. It may be from an anthropogenic standpoint, but is less obvious from a natural/environmental stand point.

b. Describe and explain how 160 m^3/s was determined to be adequate to maintain river ecological functions.

15. Supplemental Information Request 1, Question 67, Pages 2.101-2.102
Supplemental Information Request 1, Question 67, Figure IR67-1, Page 2.102

Alberta Transportation states *there is no comparable data set in which to do an independent validation and that the calibration shows the simulation reproduces the measured water levels in terms of the variation magnitudes and phases, except at the peak.*

If a model is calibrated using a given set of data and the model is subsequently run to simulate the same scenario (from which the numbers were used to calibrate the model, as done in Figure IR67-1), it is a given that the model will produce similar results.

a. If the model has not been validated, quantify the expected error range or uncertainty/confidence in modelled numbers for the scenarios run with the model. Also, provide the associated level of confidence for each.

16. Supplemental Information Request 1, Question 70, Page 2.107

Alberta Transportation states that *however, sediment related parameters are bound with sediment particles and will not be available for biological assimilation (Volume 3B, Section 7.4.6, page 7.20- 7.23). Only 1.8% of the sediments entering the reservoir (for a design flood) will be released from the reservoir….*

Some parameters may behave similar to sediment and/or be sediment related, that does not necessarily mean they are sediment bound and/or biologically unavailable. Any constituent still dissolved in water is available for biological assimilation (e.g., TDP).

a. Explain how all *sediment related parameters are bound with sediment particles*.

17. Supplemental Information Request 1, Question 83, Pages 2.127-2.129
Supplemental Information Request 1, Question 83, Figure IR83-1, Page 2.127
Supplemental Information Request 1, Question 101, Pages 2.175-2.177

Alberta Transportation provided a description of dissolved oxygen (DO) measurements and changes to water temperature.

a. Explain if there is a possibility for further decreases in DO concentration within the Elbow River during release of relatively warmer water from the reservoir and/or an

increase in nutrient loading (and other sediment related parameters), given that summer DO concentrations are already relatively low at times.

b. Explain the effects to aquatic resources in the Elbow River due to changes in DO caused by reservoir water release during summer. Use the assumption that the existing aquatic biological community may already be stressed by low DO concentrations.

c. Quantify changes to reservoir water temperature and DO concentrations caused by differences (e.g., increases) in water retention periods.

d. Assess the effects of elevated water temperature on the health of fish and fish use of habitats for each indicator fish species and life stage.

18. Supplemental Information Request 1, Question 86, Page 2.139

Alberta Transportation concludes that *therefore, concentrations returning to Elbow River are predicted to be similar to when they entered the reservoir.*

a. Describe how nutrient concentrations in water released from the reservoir will compare to water in the Elbow River at the time of release (i.e., when flow is <20 m^3/s and relatively more clear), not at the time of diversion (i.e., during flood conditions).

b. Explain how differences in timing of nutrient release may affect the Elbow River.

c. Provide/quantify expected nutrient concentrations for released water.

19. Supplemental Information Request 1, Question 92, Page 2.146
Supplemental Information Request 1, Question 342, Page 5.225

Alberta Transportation states that the *assessment of aquatic ecology uses desktop and field analyses to evaluate Project-related effects, and the assessment relies on the Project data to address the Project- related effects using Fisheries and Oceans Canada's pathway of effects (DFO 2014) to indicate which Project activities will or may result in an effect.* In addition, Alberta Transportation also states that *surveys to generate quantitative population estimates of fishery resources were not conducted as part of the assessment.*

Baseline information that describes the species composition, distribution, abundance, movements, habitat use, habitat quality, and life history parameters of fish populations currently residing within the LAA are not presented. A general description of fish species ecology and habitat requirements provides limited information and a coarse understanding of the Elbow River fish ecology, making it difficult to evaluate potential project effects.

a. Explain how the baseline information can be used to adequately describe species composition, distribution, abundance, movement, habitat use, habitat quality, and life history parameters of fish populations actually residing within the LAA and evaluate the potential project effects.

b. Demonstrate that data summaries generated by the desktop review and from data collected by the field program is of sufficient quality to reliably describe the LAA fish community structure (i.e., species composition) and the LAA species population characteristics (spatial distribution, relative abundance, movements, habitat use and life history). Include a discussion of the:

i. Current relevance of FWMIS information to describe existing fish resources.
ii. Field program specifics, including sampling methods and timing.

c. Demonstrate that the fish data presented is accurate and sufficient to meet requirements in the Terms of Reference Section 3.6.1 and to permit confident evaluation of project effects on LAA fish species populations.

20. Supplemental Information Request 1, Question 95, Pages 2.150-2.154
Response to CEAA IR, Package 3, Response IR3-26a, Page 114

Alberta Transportation states that *fish passage criteria and abilities are presented in the response to IR91 (and further discussed in Appendix IR91-1, Table 1) and presented here as Table IR95-1, and that Figure IR95-1 demonstrates the ability for the noted species in Elbow River to move up and downstream of the service spillway and stilling basin.*

a. Justify the use of the Pike Group swimming performance curve given that it is based on a derived equation intended to represent Northern Pike.

b. Demonstrate the ability to pass burbot through the instream works under each of the flow scenarios (as presented in IR3-26) using swimming performance data for Eel Group.

c. Justify the use of a minimum water depth of 0.18 m over the gate bays as criteria for successful fish passage, addressing water depth requirements for the individual Elbow River fish species and fish sizes predicted to require passage.
i. Include the time period, flow regime (discharge), and hydraulics of the passage structure that will occur when fish passage is required.
ii. Identify limitations to fish passage for each fish species.

d. Provide a figure of sufficient scale to allow clear identification of preferred fish movement routes within the service spillway and the stilling basin.

21. Supplemental Information Request 1, Question 93, Pages 2.147 to 2.148
Response to CEAA IR, Package 3, Appendix IR26-1, Figure 1 and 2, Page 26-1.2

Alberta Transportation states in the SIR1 response that the *proposed engineered fish passage measures are designed to maintain sufficient depth for fish passage*. Alberta Transportation indicates in the CEAA IR response package that the fish swimming criteria used as a basis for fish passage structure design set minimum fish length at 250 mm.

a. Demonstrate that all fish sizes and fish swimming abilities of species expected to require upstream passage have been incorporated into the design and operation of the fish passage mitigation structures, including an evaluation of effectiveness to pass small fish (≤ 150 mm length) during all flow scenarios.

b. Discuss limitations to the effectiveness of upstream fish passage caused by design criteria of ≥ 250 mm fish length. Include a discussion of upstream fish during higher than low flow conditions.

c. Discuss the expected life span of the mitigation measures in terms of structural stability and as-built specifications.

22. Supplemental Information Request 1, Question 98, Pages 2.159-2.161

Alberta Transportation states *Backwater effects from flood operations are not expected to degrade existing habitat upstream of the diversion inlet, given that the area does not currently offer instream and nearshore habitat complexity. Reforming channel flows are likely to result in habitat of similar quality and fish migration is expected to be maintained. Alberta Transportation also describes that The backwater effect will primarily occur upstream of the service spillway and diversion intake forebay area (see additional explanation of the backwater effect in the response to IR73b). The service spillway and stilling basin are near bed grade and will promote preferential flow through the structures and downstream despite any backwater effect (i.e., are designed to accept flood flows without impeding bedload sediment transport). The deposition from the backwater effect in flood operations is, therefore, not expected to affect hydraulics in the stilling basin and will not result conditions that impede fish passage.*

a. Demonstrate that the habitat assessment used as the basis for this statement quantified nearshore habitat complexity.

b. Demonstrate that sediment deposition upstream of the service spillway will not alter the channel gradient through the stilling basin fish passage structure.

c. Demonstrate that sediment deposition upstream of the service spillway will not cause sediment deposition in the stilling basin fish passage structure due to erosion of a new channel through the sediments deposited upstream of the service spillway.

23. Supplemental Information Request 1, Question 99, Page 2.162

Alberta Transportation states that *bed elevation differences less than 0.2 m accounts for 99.0% of the overall area. Therefore, the overall impact is not anticipated to result in morphological change in the river, and that a change less than 0.2 m on bar heads is considered a small change to habitat that is not detrimental to fish habitat.*

Many species and life stages of fish populations that reside in the Elbow River utilize fish habitats defined by water depths less than 0.2 m (e.g., trout and mountain whitefish spawning areas, large-fish species rearing areas, and small-fish species habitat).

a. Provide further justification that changes in fish habitat less than 0.2 m, including areas with water depths of less than 0.2 m, will not be detrimental to fish species.

b. Assess the effects of changes in channel morphology on each indicator fish species at each life stage.

24. Supplemental Information Request 1, Question 100, Pages 2.166 to 2.175
Supplemental Information Request 1, Question 100, Table IR100-1, Page 2.167
Supplemental Information Request 1, Question 100, Table IR100-2, Page 2.171

Alberta Transportation provides Table IR100-1 and states that *release of sediment into the Elbow River when flows are less than 20 m^3/s could affect the quality of fish habitat in the Elbow River downstream of the confluence with the unnamed creek.*

a. Identify the effects, and evaluate the consequences, of a sediment release for a duration of 30 days comparing released water total suspended solids (TSS) to background Elbow River TSS concentrations.

Alberta Transportation provides Table IR100–2, which, as referenced, is not a risk evaluation based on a specific stress index metric.

b. Quantify the effects of predicted suspended sediment concentration on each indicator fish species and life stage using an accepted stress index metric.

c. Estimate the spatial extent of suspended sediment effect on the Elbow River fish habitat downstream of the diversion. Evaluate the effects of increased suspended sediment concentrations and the deposition of sediment on fish habitat for each indicator fish species at each life stage.

25. Supplemental Information Request 1, Question 102, Pages 2.178 to 2.180

Alberta Transportation provides discussion on identifying the potential sources of TGP and how the Project design provides mitigation in the unlikely event that TGP occurs.

Water entrainment depth, an important factor influencing total gas pressure (TGP), is not provided. TGP levels were not estimated for expected flood flows.

a. Evaluate the potential for elevated TGP levels using project design features identified in USACE (2002).

b. Provide an evaluation of the effect and extent of elevated TGP on indicator fish species populations (including habitat use and health) in the Elbow River. Base the evaluation on estimates of TGP levels for expected flood flows caused by differences between the spillway gate crest water elevation and stilling basin water elevation.

26. Supplemental Information Request 1, Question 104, Page 2.184

Alberta Transportation states that cumulative effects on aquatic ecology are not anticipated between the Project and Glenmore Dam and Glenmore Reservoir. Specifically, regarding potential pathways arising from direct Project effects, effects on water quality and fish mortality are not anticipated to interact with the Glenmore Dam and Glenmore Reservoir.

a. List the predicted residual project effects in the aquatics ecology LAA. Include indicators used for hydrogeology, hydrology, surface water quality, and aquatic ecology for project Construction, Dry-Operations, Flood, and Post-flood Operations.

b. Provide justification as to why a cumulative effects evaluation is not required where residual project effects are predicted.

c. Describe any cumulative effects of the Glenmore Dam and Reservoir operations on aquatic ecology.

27. Supplemental Information Request 1, Question 153, Page 3.29

Alberta Transportation states that *since March 2018, Alberta Transportation has also received a final TUS from the Blood Tribe/Kainai, and technical reviews of the EIA from the Blood Tribe/Kainai, Piikani Nation, and Tsuut'ina Nation. Alberta Transportation has provided responses to the issues and concerns raised, where possible, both at meetings and in writing, and explained the proposed mitigation measures. Written responses to the technical reviews provided by the First Nations are forthcoming. Further consultation is anticipated to ensure all issues and concerns are responded to.*

a. Provide the final Traditional Use Study (TUS) from the Blood Tribe/Kainai.

b. Provide the technical reviews of the EIA from the Blood Tribe/Kainai, Piikani Nation, and Tsuut'ina Nation, and any other First Nations or Aboriginal communities that have provided such reviews.

c. Provide Alberta Transportation's written responses to the technical reviews.

d. Confirm any TUS reports Alberta Transportation expects will be provided by other Treaty 7 First Nations and any other First Nations or Aboriginal communities required to be consulted.

28. Supplemental Information Request 1, Question 342, Page 5.227
Supplemental Information Request 1, Question 342, Table IR342-1, Page 5.226
Supplemental Information Request 1, Question 342, Table IR342-2, Page 5.227
Alberta Transportation presents new information in Tables IR342-1 and IR342-2 that quantifies the status of bull trout and westslope cutthroat trout populations and states that *population level fisheries data was not collected in the Elbow River*. There is an absence of information for fish species other than trout.

a. Explain how the new data (Tables IR342-1 and IR342-2) was incorporated into the effects assessment.

b. Discuss how the variability and level of detail in information used for the population estimates, including the absence of population estimates for fish species other than trout, influences the reliability of the conclusions of the effects assessment.

29. Supplemental Information Request 1, Question 346, Page 5.233
Alberta Transportation states that *large woody debris taken from the debris deflector, intake structure, and gates will be removed from the beds and shores and will not be reintroduced downstream in the river*.

a. Quantify the amount of woody debris that will be removed from the system downstream of the project relative to the total amount that would be available without the project.

b. Evaluate how the loss of woody debris recruitment to the lower Elbow River will affect fish habitat and aquatic productivity.

30. Supplemental Information Request 1, Question 348, Page 5.235
Alberta Transportation states *suspended sediment concentrations in the water from the off-stream reservoir is predicted to increase during the last few days and that without mitigation the resulting increase in the Elbow River of suspended sediment concentrations is likely to exceed the Canadian Water Quality Guideline*.

a. Delineate and quantify the downstream extent of total suspended solid (TSS) concentrations that exceed water quality guidelines for the protection of aquatic life for the 1:10 and 1:100 flood events.

b. Provide an evaluation of impacts downstream from the release of turbid water over an extended period of time for fish survival, fish habitat, and aquatic productivity. The severity of ill effects dose-response curve can be used to evaluate impacts on fish survival.

c. Provide estimated frequency of flood water release during the period of September 01 to October 31 for the 1:10 and 1:100 year flood event.

d. Describe where and when Elbow River mountain whitefish and brown trout populations spawn in the Elbow River downstream of the outlet structure.

e. Evaluate effects of elevated suspended sediment levels and increased duration of elevated suspended sediment concentrations on species populations (i.e., mountain whitefish and brown trout) potentially using the portion of the Elbow River below the outlet structure for spawning during post-flood reservoir draining.

31. Supplemental Information Request 1, Question 350, Pages 5.245-5.247

Alberta Transportation states that *the potential for 80% of fish being displaced is considered conservative and high, that the relationship between fish displaced and percent of flow is likely less than 1:1, and that development of a new model would not reduce uncertainty in the assessment.*

a. Outline mitigation measures and monitoring programs to be implemented to ensure survival of fish entrained into the diversion channel, excluding efforts associated with fish rescue.

32. Supplemental Information Request 1, Question 351, Page 5.248

Alberta Transportation states that *areas within the reservoir will be graded to provide positive drainage and reduce stranding of fish during release of stored flood water from the reservoir* and that a fish monitoring program and rescue plan will mitigate impacts caused by fish entrainment.

a. Provide examples of, and discuss, the effectiveness of fish rescue operations in large impoundments dominated by silt substrates and those that are subjected to rapid dewatering.

b. Quantify the likelihood of survival of fish trapped within the reservoir that are subjected to predicted TSS concentrations for the duration of the water retention period using the severity of ill effects dose-response curve.

33. Supplemental Information Request 1, Question 353, Page 5.257

Alberta Transportation states that *conditions and engineering criteria for fish passage are well understood and are incorporated into the service spillway structure design* and that *thresholds for water level, as indicated by the pressure transducer, will indicate when volumes of water over the diversion gates and v-weirs are inadequate for fish passage and gate operations are required.*

a. Justify and explain how a good understanding of conditions and engineering criteria for fish passage will ensure, with certainty, upstream and downstream fish passage of all Elbow River fish species at all life stages under all flow conditions.

b. Describe if a monitoring program that quantifies actual fish passage is proposed. If no monitoring program that quantifies actual fish passage is proposed then explain why not.

34. Supplemental Information Request 1, Question 357, Pages 5.279 to 5.280

Alberta Transportation states that *bull trout are not expected to spawn in the portion of the Elbow River that is in the PDA or downstream of the of the PDA; however, they may migrate upstream through the PDA to upstream spawning locations and downstream after spawning, but this is not confirmed* [Page 5.279] and that *[m]uch of Elbow River, from the Elbow River falls to Glenmore reservoir, could be used for migration during various life history stages*.

a. Map and describe fish habitat areas (i.e., physical locations, including ecologically important areas) used by bull trout populations in the Elbow River. Include spawning, nursery, rearing, food supply and migration areas, on which the bull trout population depends.

b. Summarize data gaps in bull trout fish habitat information (including spawning, nursery, rearing, and food supply), migration areas and the presence of known ecologically important areas. Evaluate how these data gaps influence the effects assessment.

c. Map and describe existing fish habitat areas including mountain whitefish. Include ecologically important areas, used by each of the fish species populations identified in Response 357b. Include spawning, nursery, rearing, food supply and migration areas, on which each population depends directly or indirectly in order to carry out their life processes.

d. Summarize data gaps in fish habitat information used by each fish species population identified in Response 357b including spawning, nursery, rearing, food supply and migration areas, and evaluate how these data gaps influence the effects assessment.

35. Supplemental Information Request 1, Question 415, Page 6.134

Alberta Transportation states the *Enforcement Occurrence Record (ENFOR) data were not used in this assessment because the majority of records do not provide spatial locations of animal occurrences and can only be extracted using broad geographic areas (e.g., wildlife management units (WMU)), which extend beyond the wildlife LAA and wildlife RAA* and that *with the potential for there to be managed access to the PDA, human-grizzly bear conflict and conflicts with other wildlife species could increase; however, the frequency of grizzly bear use is expected to be low based on the information presented in Volume 3A, Section 11.2.2.2, page 11.28, which indicates the wildlife LAA provides relatively low suitability habitat. In addition to the mitigation commitments in Volume 3B, Section 11, Alberta Transportation (and AEP for operations) will implement beneficial management practices designed to reduce potential increase in human-wildlife conflict (e.g., signage, safety, education).*

a. Describe how discrepancies between AEPs and Alberta Transportations information on grizzly bear use of the project area changes conclusions on impacts to grizzly bears (e.g., human-bear conflict, mortality, etc.).

b. Detail a plan to proactively reduce human-bear interactions and how these will be minimized and monitored.

36. Supplemental Information Request 1, Question 425, Page 6.147
Supplemental Information Request 1, Appendix IR425-1, Pages 1.1 to 9.2
Alberta Transportation states a *draft wildlife mitigation and monitoring plan…in Appendix IR425-1. The final plan will be developed following Project approval and based on provincial and federal approval conditions.*

a. Provide details on what would be included within biodiversity monitoring plans for birds and amphibians in the monitoring program (which may consider the use of bioacoustics).

b. Describe specifics on how comparisons and assessments were completed for bird and amphibian species richness between baseline, construction and dry operation, flood and post-flood operations, and how these will be incorporated into the mitigation and monitoring plan.

37. Supplemental Information Request 1, Question 428, Pages 6.153 to 6.155
Supplemental Information Request 1, Appendix IR425-1, Pages 1.1 to 9.2
Alberta Transportation states that *remote cameras are a common tool used to determine potential effects of human development on wildlife as well as to evaluate the effectiveness of mitigation measures (McCollister and van Manen 2010; Barrueto et al. 2014; Burton et al. 2015; Andis et al. 2017; Caravaggi et al. 2017). The purpose of the remote camera monitoring program (as part of the draft wildlife mitigation and monitoring plan; see Appendix IR425-1) is to verify predictions related to residual effects of the Project on wildlife movement in the wildlife LAA, particularly for ungulates such as deer and elk.*

a. Describe how remote camera data could provide quantitative information on wildlife movement to support impact predictions.

b. Clarify how data from remote cameras will be used to test wildlife impact predictions (e.g., detail the relationship between camera trap detection and the ecological parameter of interest, such as habitat use and movement).

c. Demonstrate that baseline camera data is sufficient to detect changes in habitat use and movement in follow-up and monitoring programs.

38. Supplemental Information Request 1, Question 447, Page 7.42
Volume 3A, Section 15.7, Page 15.65
Alberta Transportation discusses the exposure ratio (ER) for short term exposures to $PM_{2.5}$ and diesel exhaust particulate (DEP). A discussion on chronic effects to the residential receptor (SR19) is not provided, which has an exposure ratio greater than 1.

a. Discuss $PM_{2.5}$ (chronic) risk results for residential receptor SR19 in the conclusion section of the Public Health Report (Volume 3A, Section 15.7), or provide rational for its exclusion.

39. Response to CEAA IR, Package 3, Response IR3-32a, Page 130
Alberta Transportation provided quantitative risk estimates for hexavalent chromium and trivalent chromium to provide estimates of risk associated with anticipated airborne exposure during the construction phase.

a. Clarify whether life-time exposure or a three-year construction exposure were used in the above risk estimate.

2 General

2.1 Socio-Economic

40. Supplemental Information Request 1, Question 165, Page 3.57
Supplemental Information Request 1, Question 179, Page 3.75
Supplemental Information Request 1, Question 181, Page 3.79

In question 181 Alberta Transportation states *the types of measures that fail as the intensity of the flood increases include lower dykes (less that 1:50 year), flood outfall gates and temporary barriers.*

In question 165 Alberta Transportation states *AMEC (2014) recommended that assessments of SR1 and MC1 Option be progressed until such time that one becomes preferred*.

In question 179 Alberta Transportation states *RFDAM provides an estimate of flood damage for 12 return periods and allows for the computation of annual damage. It is predicated on myriad of qualified assumptions, and no uncertainty factor is applied to the values*.

a. Indicate if the following probabilities and their values were estimated: the probability of the structure failing
   i. to work at all;
   ii. to work partially;
   iii. in a controlled manner;
   iv. in an uncontrolled manner.

b. Indicate if these probabilities and values are factored into the cost benefit analysis and if so how they impacted the cost benefit analysis. If they were not factored into the cost benefit analysis, explain why they were excluded.

c. If the probabilities were deemed to be zero in the cost benefit analysis, provide the evidence and explain the procedures undertaken to assure the structure's design will work as intended. For example, reviews of similar weirs, assessments of contractors with expertise to construct these weirs, potential of conditions/events when the weir will not work properly, feasibility assurance mechanisms in the project's identification and design, and post-construction testing procedures that will assure the weir will work properly after it is constructed.

d. Identify events that will delay the successful construction and operationalizing of this non-conventional structure working and therefore delay of benefits in the cost benefit cash flow. Evaluate the probability and length of the delay. Estimate the impact on the cost benefit analysis.

e. The SIR response refers to the McLean Creek project in the cost benefit analysis. Assess whether the McLean Creek project might have similar probabilities of failure and/or delay in consideration of its more conventional dam and spillway design.

f. Provide an assessment of whether the factors (a) through (e) impact the relative merits of the Springbank Project in the cost benefit analysis.

41. Supplemental Information Request 1, Question 184, Page 3.84

Alberta Transportation states *Flood damage estimation and benefit/cost analysis methodologies associated with flood damage reduction studies are well-established in literature and have been recently formalized by virtue of the Government of Canada's publication: Canadian Guidelines and Database of Flood Vulnerability Functions, Public Safety Canada, March 2017, authored by IBI Group*.

a. Confirm that Public Safety Canada / Federal Government did not publish the document *Canadian Guidelines and Database for Flood Vulnerability and Database of Flood Vulnerability Functions (March 2017)*. Correct the SIR response to indicate that the publication has not yet been released.

b. Confirm that Natural Resources Canada is undertaking a review and edit of this document before its potential release.

42. Supplemental Information Request 1, Question 194, Pages 3.93 and 3.94

Alberta Transportation indicates that the costs associated with relocating the pipelines are covered by the project and included in the cost-benefit analysis. They also indicate that the companies will absorb the loss of income due to disruption in the pipeline flow during relocation.

Loss of income by the companies who own and operate the pipelines is technically a societal cost for the purpose of the cost-benefit analysis.

a. Calculate the loss of income imposed to the companies who own and/or operate the pipelines to be relocated. Add this loss of income to the costs in the cost-benefit analysis. How has the cost-benefit analysis changed? Explain.

43. Supplemental Information Request 1, Question 196, Page 3.95

Alberta Transportation indicates that the costs associated with relocating utilities are covered by the project and included in the cost-benefit analysis. Alberta Transportation goes on to indicate that utility companies will absorb the loss of income due to disruption of infrastructure services.

Loss of income by the utility companies is technically a societal cost for the purpose of the cost-benefit analysis.

a. Calculate the loss of income imposed to utility companies whose infrastructure would have to be relocated. Add this loss of income to the costs in the cost-benefit analysis. How has the cost-benefit analysis changed?

44. Supplemental Information Request 1, Question 197, Page 3.96
Supplemental Information Request 1, Appendix IR17-1, Table 17-25, Page 17.36

Alberta Transportation indicates that Table 17-25 in Appendix IR17-1 lists the Project costs that are estimated to be procured in the LAA, and that information is aggregated by major cost category, not by sub-components. The proponent also states *The cost of traffic accommodation (including traffic detours, land closures, etc.) is embodied in the information provided in Table 17-25, including the following cost items: "construction services" and "engineering services". The updated Table 17-25 is based on the current cost estimate ($312.2 million, exclusive of land cost)*.

a. The proponent did not clarify if these costs were included in the cost-benefit analysis. Clarify if the costs associated with traffic detours during construction, road

realignments, and modifications were included in the cost-benefit analysis. If these costs were not included in the cost-benefit analysis explain why they were excluded.

b. The total costs included in Table 17-25 add up to $224 million, but the cost quoted by the proponent in their response is $312.2 million. Clarify what is the correct value of the current cost estimate. Correct the table or the response so that the correct value is indicated.

3 Air

3.1 Air Quality Assessment

45. Supplemental Information Request 1, Question 209, Page 4.9

The following observations regarding the rationale that odours will not be generated are:

- A comparison of the Springbank Reservoir to the Glenmore Reservoir is not reasonable given that the Glenmore Reservoir will have a constant inflow and outflow whereas the Springbank Reservoir will be stagnant for many weeks during the warmest time of the year.
- There is no guarantee that wind action will occur at sufficient velocity to stir the reservoir. If a wind action occurs late in the detention time there is the potential to destabilize stratification such that odours are released. There are several examples of this phenomenon in Alberta reservoirs (some are called lakes) as follows:
  i. Henderson Lake in Alberta;
  ii. Sunshine Lake in Okotoks;
  iii. Jesse Lake in Bonnyville; and
  iv. Bridlewood in Calgary.

a. Respond to the original question. What measures would be considered to mitigate air quality if anaerobic or anoxic conditions occurred?

46. Supplemental Information Request 1, Question 210a, Page 4.11

Alberta Transportation states the current speed limit on Highway 22 is 80 km/hour which is incorrect. The current speed limit on the segment of Highway 22 (between the Highway 8 and Highway 1 intersections) is 100 km/hour.

a. Update the SIR response using the correct and current Highway 22 speed limit of 100 km/hour.

4 Water

4.1 Hydrogeology

47. Supplemental Information Request 1, Question 216, Page 5.8 – 5.9

Alberta Transportation states *a. Poroelastic response of an aquifer "loading effect" is generally limited to cases where the aquifer is fully confined over a wide area. By contrast, the groundwater regime in the RAA is characterized as an unconfined to semi-confined system, as is discussed in Section 3.2 of the Hydrogeology TDR Update (see the response to IR42, Appendix IR42-1). While some localized subsurface pressure response is expected near the Project components, regional scale poroelastic response within the bedrock aquifer is not expected to occur due to a lack of regional scale confinement.*
b. A regionally mappable clay layer does not exist underneath the fluvial deposits of the Elbow River. In general, the fluvial deposits of the Elbow River directly overlie bedrock.
c. Potential changes in groundwater levels are assessed by the numerical groundwater model, as described in the Hydrogeology TDR Update. However, changes in groundwater levels within the bedrock are not expected to be caused by poroelastic response because the bedrock is not regionally confined.
d-e. A draft groundwater monitoring plan for changes in groundwater levels is presented in the response to IR46, Appendix IR46-1. While poroelastic pressure response in the bedrock is not anticipated, monitoring of bedrock is included as part of the draft groundwater monitoring plan.

The most dangerous area of the potential loading effect is in the low topography area to the East and South-east of the off-stream dam. It is very likely the groundwater is under a confined condition due to its location in the relative low land area, especially when it is under the condition of a flood.

The potential loading effect is not related to the whole RAA with an area of approximately 43,050 ha. The groundwater as a whole maybe in the conditions of unconfined or semi-confined, but for the site specific issues, groundwater is very likely in the confined condition. Therefore, the potential loading effects to the East and South-East of the off-stream dam are valid.

From the East half of the off-stream reservoir to the East boundary of the RAA, the bedrock underneath is the Paskapoo formation (figure 3-4, Appendix IR42-1).In the western plains of Alberta the Paskapoo is characterized by buff-weathering, light grey to greenish thick bedded, calcareous quartz/chert sandstone, with interbedded light grey to greenish or brownish, soft, calcareous, sandy siltstone (Williams and Dyer, 1930; Allan and Sanderson, 1945; Glass, 1990). It contains significant hydrogeological resources which are currently being exploited for agricultural, municipal and industrial uses.

The geological and hydrogeological characteristics of the Paskapoo formation support the potential groundwater pressure connection between the off-stream reservoir to the East and South-East of the off-stream dam through the loading effect when the reservoir is in use.

a. Simulate the loading effect of the Springbank Off-Stream Reservoir on the confined aquifer to the East and South-East low topography areas of the off-stream dam.
b. Predict the potential artesian areas under the loading conditions in the area to the East and South-East of the low topography areas of the off-stream dam.

c. Assess the environmental impact of the loading effect.

d. Propose a monitoring plan for the loading effect and explain how this plan was derived.

e. Design a mitigation plan for the loading effect.

f. If Alberta Transportation decides not to do the analysis based on the same unconfined/semi-confined condition in the RAA, provide the contingency plan to deal with the potential groundwater "gush out" to the East and South-East of the off-stream dam should this occur.

48. Supplemental Information Request 1, Question 217, Page 5.9 – 5.13
Supplemental Information Request 1, Appendix IR42-1, Figure 5-7, Page 5.13
Supplemental Information Request 1, Appendix IR42-1, Figure 5-9, Page 5.16
Figure 5-7 in Appendix IR42-1 is the Simulated Net Change in Head for the PPX0/EEX0 Scenario. There is positive drawdown (white area) along the edge of the diversion channel (the channel). The water level is higher along the edge of the channel (Figure 5-9 in the Appendix IR42-1) than the water levels further away from the channel, which will prohibit the discharge of the groundwater to the channel.

a. These anomalies will underestimate the groundwater seepage to the channel.
   i. Are these anomalies related to geological change or are they related to grid size change? Explain.
   ii. Provide the updated seepage number after the anomaly problems are fixed. Explain this number.
   iii. Provide an analysis of the size of the impact the anomalies have on the groundwater seepage estimation to the channel.

b. Provide groundwater flow directions on Figure 5-7 of Appendix IR42-1 to confirm if the local groundwater flow directions are towards the channel.

49. Supplemental Information Request 1, Question 230, Page 5.27 – 5.28
Supplemental Information Request 1, Appendix IR42-1, Figure 3-20, Page 3.41
Alberta Transportation states *a. The bedrock varies from unconfined to semi-confined to confined across the groundwater RAA …*

The site specific issue such as the loading effects to the East and South-East of the off-stream dam is not relevant to the whole RAA with areas of approximately 43,050 ha.

a. Subtract Figure 3-20 of the potentiometric surface of the upper bedrock in Appendix IR42-1 by the bedrock top structure, hatch and the confined areas. Note, the confined area will be much larger when the reservoir is under usage.

b. Explain if it is in the confined condition to the East and South-East of the off-stream dam.

c. Simulate the loading effect if it is in the confined condition to the East and South-East of the off-stream dam.

d. Subtract the water level in bedrock under the situation of loading effect by the DEM.

e. Estimate the area of the potential artesian areas.

f. What is the highest water level above DEM in the potential artesian areas?

g. Propose a monitoring plan to monitor the potential loading effect and explain how this plan was created.

h. Design a mitigation plan to reduce or eliminate the potential artesian impact and explain how this plan was created.

50. Supplemental Information Request 1, Question 237, Page 5.36

Alberta Transportation states *The original groundwater LAA did include the area over which potential "loading effects" could occur…*

Alberta Transportation did not complete the potential loading effects analysis. It is only argued that the bedrock is under unconfined or semi-confined conditions in the whole Regional Assessment Area (RAA), so it is impossible to have a loading effects in the RAA. The problem is that potential loading effects to the East and South-East of the off-stream dam may exist when the off-stream reservoir is under usage.

a. Modify the extent of the LAA to the East and South-East of the off-stream dam to include the area affected by the potential loading effects.

b. Analyse the impact of the LAA change to the land purchase and management.

51. Supplemental Information Request 1, Question 240, Page 5.37 – 5.38

Alberta Transportation states *b-c. There are no differences in the model at local versus regional scales because these two scales are fully accounted for.*

The RAA covers an area approximately 43,050 ha. The regional geological model can not capture the important features which are valuable to the local impact assessment, such as the diversion channel and the off-stream dam seepages' prediction, and the potential loading effects analysis to the East and South-East of the off-stream dam.

a. Compare the following wells' drilling logs vs the geological units at the same location from the RAA geological model. How big is the difference between:
   i. MW16-16-11, MW16-18-10;
   ii. MW16-24-30, MW16-23-26, MW16-22-26?

b. Explain the impact on the diversion channel and the off-stream dam seepages' prediction.

c. Evaluate the impact on the potential loading effects delineation, monitoring and mitigation.

52. Supplemental Information Request 1, Question 248, Page 5.48;
Supplemental Information Request 1, Appendix IR42-1, Page 4.8
Supplemental Information Request 1, Appendix IR42-1, Figure 4-10, Figure 4-11,

Page 4.12
Supplemental Information Request 1, Appendix IR42-1, Table 3-1, Page 3.33
Alberta Transportation states *Section 4.3.2 of the hydrogeology TDR Update (see the response to IR42, Appendix IR42-1) describes the parameterization of model layers. Hydraulic conductivity values for each of the model layers was parameterized based upon the hydraulic framework developed within the 3D CSM and on results of the steady state calibration runs.*

The undifferentiated bedrock unit was represented in the model with two layers, and the upper layer of the bedrock (Layer 6) was assigned higher hydraulic conductivity values to reflect the potential for this unconformable surface to be fractured and of higher permeability than the underlying bedrock (Layer 7). P.4.8 of Appendix IR42-1.

The assigned conductivities in Layer 6 and Layer 7 are 1.4E-6 m/s and 2.7469E-7 m/s, respectively (Figure 4-10 and Figure 4-11 of Appendix IR42-1). The Paskapoo formation, which is an aquifer in the Province of Alberta, has a magnitude of only one to two smaller than that of the only tested conductivity of 1.5E-5 m/s (MW15-24-30, Table 3-1 of Appendix IR42-1).

a. Explain why the Paskapoo formation, which is an aquifer in the Province of Alberta, is not separated from the rest of the bedrock.

b. Explain what the impact is when a lower conductivity for the model calibration and prediction has been assigned.

53. Supplemental Information Request 1, Question 250, Page 5.49 – 5.50
Alberta Transportation states *c. Two layers were created for the bedrock unit.*

a. What is the thickness assigned to the upper bedrock layer (Layer 6)? Explain.

54. Supplemental Information Request 1, Question 251, Page 5.50
Supplemental Information Request 1, Appendix IR42-1, Figure 5-3, Page 5.5
Alberta Transportation states *c. The time varying boundary conditions were applied to the uppermost layer of the model. This was done to simulate the effect of temporary retaining water on the land surface in the off-stream reservoir.*

The time varying boundary conditions should be match to the reality. If the river cuts to the second or third layers of the model, the river boundary should be applied to all of the second and third layers. Similarly, some areas in the off-stream reservoir have bedrock out-crops, and in this case, the time varying boundary conditions should be applied from the top to the bedrock layers. Otherwise, the model can not mimic real situations.

For potential loading effects simulation to the East and South-East of the off-stream dam, it is the pressure response instead of the water particle movement; to evaluate the potential loading effects from the conservative point of view, the boundary condition in Figure 5-3 (Appendix IR42-1) should be applied in the confined bedrock layer in the area of the off-stream reservoir.

a. Apply the boundary condition in Figure 5-3 (Appendix IR42-1) from the top layer to the bedrock layer in the area of the off-stream reservoir, then simulate the loading effects to the East and South-East of the off-stream dam.

b. Provide a map to show the area of the potential loading effects.

55. Supplemental Information Request 1, Question 255, Page 5.53 – 5.54
Supplemental Information Request 1, Appendix IR42-1, Table 3-1, Page 3.33
Alberta Transportation states *c. However, the behavior of a given water bearing bed within a thick formation like the Paskapoo can vary significantly from the average vertical and horizontal hydraulic conductivity. The low permeability is consistent with available data for the eastern part of the RAA.*

a. The only tested conductivity in the Paskapoo formation can be found in the eastern part of the RAA and has a value of 1.5E-5 m/s (MW16-24-30, Table 3-1 of Appendix IR42-1). Was other tested data available for the Paskapoo formation in the RAA? If so, explain why this data was not included in the RAA and the implications its exclusions may have. If there was no further tested data in the RAA to support the above statement, modify the conductivity for Paskapoo formation to reflect the practical situation in the RAA instead of the summarized conductivity from all the bedrock layers.

b. Re-do the calibration and prediction, including the seepage amount under the off-stream dam. Explain the calibration and prediction methodology used.

c. Analyze and explain the differences of the calibrations and predictions for both the lower and higher conductivities for Paskapoo formation.

56. Supplemental Information Request 1, Question 257, Page 5.56
Supplemental Information Request 1, Appendix IR42-1, Figure 5-7, Page 5.13
Supplemental Information Request 1, Appendix IR42-1, Figure 5-9, Page 5.16
Alberta Transportation states *a, c. The numerical model was run using unconfined conditions given the limited lateral extent of confining layers*

The regional model has an area of approximately 43,050 ha. The RAA has the limitation that it is unable to solve the problems for Diversion Channel seepage and the potential loading effects to the East and South-East of the off-stream dam. Not only is it not efficient, but the site specific problems are overlooked. The drawdown and groundwater level anomaly along the diversion channel (Figure 5-7, and Figure 5-9 of the Appendix IR42-1) may also belong to the regional model limitation as well.

As per the September 6, 2018 meeting between Alberta Environment and Parks, Alberta Transportation and Stantec two local models were recommended and are required to understand and solve the diversion channel seepage and the potential loading effects. Provide:

a. A local model for diversion channel seepage prediction.

b. A local model around the off-stream dam for loading effects analysis and prediction.

4.2 Hydrology

57. Supplemental Information Request 1, Question 261, Page 5.68
Alberta Transportation states *The runoff volume related to the 2013 flood was calculated based on the hydrograph at Glenmore Reservoir, and the off-stream reservoir is designed to accommodate such a flood.*

a. Provide the data source of the hydrograph at the Glenmore Reservoir.

58. Supplemental Information Request 1, Question 269, Page 5.83
Supplemental Information Request 1, Appendix IR302-1, Page 4.3
Supplemental Information Request 1, Question 276, Page 5.94

Alberta Transportation has referred to Appendix IR302-1 in SIR1 question 269 response. Alberta Transportation states in the Surface Water Monitoring Plan (Appendix IR302-1, page 4.3) *maintenance activities in the PDA to prepare the infrastructure for the next flood that would have a portion of its waters directed into the off-stream reservoir (from a decade to decades in the future).*

Alberta Transportation also states *The operation of the reservoir will occur infrequently (once every ten years), so the nature of the change is not anticipated to change the water quality of Elbow River or Glenmore Reservoir.*

a. Explain what is meant by the next diversion will occur *from a decade to decades in the future*?

b. Explain what is meant by the operation of the reservoir will occur *once every ten years*?

c. In both of these cases, are the terms *decade* and *once every ten years* referring to 1:10 year flood events when the flow will exceed 160 m^3/s which is close to the 1:10 year flood event? If so, then this is an incorrect interpretation of the definition of a 1:10 year flood event, to address frequency of maintenance activities and risk associated with water quality. The term 1:10 year flood indicates the probability of occurrence of that flood in a given year.

d. Provide the timeline by which the maintenance activities will be completed after a flood, so that the infrastructure is prepared for the next 1:10 year or bigger flood events that may occur the following year.

e. Explain what types of impacts the project may have on downstream licence withdrawals in the event the project is in operation more frequently (for example, with less than ten years gap in-between operations).

59. Supplemental Information Request 1, Question 272, Page 5.86

a. The response to SIR1 question 272 is not relevant to the question asked. Provide the correct response.

60. Supplemental Information Request 1, Question 274, Page 5.88
Supplemental Information Request 1, Appendix IR274-1, Table IR274-1, Page 274-1.1
Supplemental Information Request 1, Appendix IR274-1, Table IR274-2, Page 274-1.15

a. Identify the ten groundwater and six surface water licences located within the PDA that will be affected, in Table IR274-1 and Table IR274-2 of Appendix IR274-1.

61. Supplemental Information Request 1, Question 289, Page 5.114
Alberta Transportation states *The influence of all aspects of water operations on hydrology, due to the combined operations of the Project and the Glenmore Reservoir*.

a. This sentence is not complete. Provide the complete sentence and fully address the questions asked in 289(a).

4.3 Surface Water Quality

62. Supplemental Information Request 1, Question 293, Page 5.124—5.130
Volume 3A, Section 6, Figure 6-12, Page 6.31
Volume 4, Appendix J, Section 2.4.2, Page 2.32
Alberta Transportation identified the boundary condition of the three modelling domains. No tributaries were identified. For example, for Model Domain (I) there were no tributaries identified to supplement the flow and suspended sediment loading coming from the upstream boundary condition at Bragg Creek. However, Figure 6-12, V. 3A, S06 includes five tributaries in the local assessment area. Furthermore, Vol 4-J page 2.32 indicates that the flow of tributaries between Bragg Creek and Sarcee Bridge was estimated.

a. Indicate how the flow and sediment from tributaries were considered in the model input.

b. If no tributaries were considered, explain why not and include the implications for sediment transport and water quality.

c. How would this affect the uncertainty of the modelling results?

63. Supplemental Information Request 1, Question 295, Page 5.131—5.134
Alberta Transportation discussed the implications of using different lengths of time to drain the reservoir (SIR1 295 [a]). However, the different scenarios presented with variations of gate openings do not provide the estimation of the TSS concentrations expected.

a. For the three scenarios (release gate at 75%, 50%, and 25% open), indicate the predicted average and maximum TSS concentrations:
   i. leaving the reservoir; and
   ii. in the Elbow River 1 km below the confluence with the unnamed Creek

b. Compare and discuss these results with the previously provided results when the gate is 100% open.

64. Supplemental Information Request 1, Question 296, Page 5.138
Alberta Transportation states *In this study, the dry, flood and wet depths were set to 0.01, 0.05 and 0.1 m, respectively*.

a. Confirm that the depth of 0.05 m represents flood and 0.1 m wet conditions.

65. Supplemental Information Request 1, Question 297, Page 5.140—5.142
Supplemental Information Request 1, Question 293, Page 5.124

Supplemental Information Request 1, Appendix IR302-1, Table 9-1, Page 9.4.
Volume 3B, Section 6.4.3.2, Figure 6-15, Page 6.36.

Alberta Transportation indicates through their responses variations of this statement: *Potential changes in water quality (i.e. concentrations and loads) associated with increases in TSS at the end of the period of water release from the reservoir are expected to be small compared to what could be expected during a flood in the absence of the project*. Alberta Transportation explains the effect of the project by having a net reduction of the annual TSS. However, this reduced load is moved from a short high-flow period to a longer clear flow period, and at a more sensitive time of the year for nutrient uptake. The guideline exceedances during the time of release still need to be well characterized for evaluation of the project. As per Table 9-1 in Appendix IR302-1 different exceedance levels are appropriate depending on the background TSS conditions. Without the project, the background concentration is high. However, the post-flood operations will release peak TSS concentrations under a clear period and for over 24 hours.

The report shows results up to 1 km downstream from the release stating this is *i.e. the farthest point in Elbow River downstream where suspended sediment was modelled*. However, the model domain (SIR1 293) is up to the Glenmore Reservoir. The modelling results showed that for the last days of release the sediment concentration would be significantly higher than the background concentration producing guideline exceedance at 1 km below the release (e.g. Figure 6-15, Vol 3B).

a. What is the spatial extent for potential adverse effects of sediment released from the off-stream reservoir for each flood scenario (i.e. what is the most downstream location where guidelines are exceeded)?

b. For how many days does the model predict exceedances of instream guidelines for each flood scenario? Identify the change in exposure time for the project (post-flood operations) and current conditions (flood without the off-stream reservoir).

c. Provide graphs and maps to understand the extent of the guideline exceedances.

66. Supplemental Information Request 1, Question 298, Page 5.142—5.143

Alberta Transportation described the potential effects of dissolved oxygen (DO) and temperature in the Elbow River. However, the explanation regarding the DO and temperature in the reservoir indicates that *changes in dissolved oxygen are expected to be smaller than currently observed in Glenmore Reservoir*.

a. Clarify the method used to determine that changes in DO are expected to be smaller than currently observed in the Glenmore reservoir. Explain all uncertainty around this estimation.

b. Indicate the average BOD, and the minimum DO concentration expected in the off-stream reservoir. How can these values affect the assessment of the Project environmental effects on water quality? What measures would be considered to mitigate effects if they are observed?

67. Supplemental Information Request 1, Question 309, Page 5.185-5.186
Supplemental Information Request 1, Question 325, Page 5.202-5.203

Supplemental Information Request 1, Question 309, Table IR309-1, Page 5.186
Volume 3A, Section 7.1.7, Page 7.9

Alberta Transportation indicates that upon release of retained water from the off-stream reservoir predicted total suspended sediment (TSS) concentrations would be well below the predicted peaks for floods that would occur without the project in place. A similar statement is made in SIR1 325 and elsewhere.

In Table IR309-1 Alberta Transportation identifies TSS concentrations in at the end of the release period from the Off-Stream Reservoir at two locations, one at the release site and one at 1 km further downstream.

Alberta Transportation states *The assessment concluded that effects from the predicted sediment concentrations are not significant.* However, the assessment concluded that *"resulting increase in the Elbow River of suspended sediment concentrations is likely to exceed the Canadian Water Quality Guidelines.*

In spite of this, in Volume 3A of the EIA Alberta Transportation provides a significance definition as *a significant adverse residual effect on water quality is defined as a measurable change in water quality that:*

- ex*ceeds an implemented water quality objective or site-specific water quality guideline for the protection of aquatic life or*
- *contravenes a watershed management target or*
- *causes acute or chronic toxicity to aquatic life or*
- *changes the trophic status of a lake or stream.*

a. Total net load would be less during the flood year when the off-stream reservoir is in operation as indicated above. Justify and explain why there is no assessment of concentrations of TSS over time (monthly) in August and September at locations downstream of the reservoir from point of release to sites within 1 km of the Glenmore Reservoir.

b. Justify and explain why there was no peak and average values further downstream in the Elbow River, considering this section is approximately 11 km long.

c. Considering the definition of significance, clarify and explain how the TSS guidelines will be exceeded and yet the effects are not significant.

4.4 Aquatics

68. Supplemental Information Request 1, Question 342, Pages 5.225-5.228

Alberta Transportation states that no quantitative estimates of fish populations (i.e. mark recapture population estimates) were available, and instead used relative abundance. Relative abundance is not effective in detecting changes to fish populations in the absence of baseline data. Population estimates are therefore more appropriate in assessing impacts (changes) to fish populations pre and post dam construction and operation.

Alberta Transportation must undertake population estimates of fish populations both prior and following dam construction and operation. This approach will allow for the detection of differences in fish populations pre and post dam construction/operation to assess whether impacts to fish are as predicted.

a. Provide quantitative population estimates for the fish species found in the Elbow River.

69. Supplemental Information Request 1, Question 343, Pages 5.228-5.229

Alberta Transportation states that fish movement was determined from studies conducted by the Alberta Conservation Association on tributaries of the Elbow River upstream of the diversion structure (Fitzsimmons, 2008). This response does not include findings from Popowich and Paul 2006 reflecting bull trout utilization of the area below the proposed dam site. The time period when the dam would be in use (April-July) would encompass the migratory window for rainbow trout, cutthroat trout/cutthroat hybrids, and bull trout.

a. How were migration patterns of fish species in the Elbow River determined apart from general life history patterns?

b. Re-evaluate fish presence, habitat utilization, and movement in the Elbow River including the work by Popowich and Paul (2006) *Seasonal movement patterns and habitat selection of Bull Trout (Salvelinus confluentus) in fluvial environments* attached. Use this new information as part of the environmental assessment (prediction of impacts) of this project.

70. Supplemental Information Request 1, Question 344, Page 5.230
Supplemental Information Request 1, Question 343, Table IR343-1, Page 5.229
Volume 3A, Section 8.4.2.1, Page 8.49
Volume 3A, Section 8.4.3.8, Page 8.55

Alberta Transportation states that flow would be manipulated (by raising the right gate of the dam) to maintain 20 cm of flow through the fish passage.

Based on this response, fisheries understands that fish passage design will only allow passage of fish in certain size ranges. This creates potential barriers to fish passage which would subsequently impact fish populations (sport and non-sport fish).

a. If non-sportfish are unable to pass, what are the impacts to populations both up and downstream of the diversion structure?

b. Describe mitigation measures to address low water depth which would be a passage restriction to large fish (such as bull trout) during low flow.

c. Describe which of these species moves through the area of the diversion structure where migration may be affected during the times described in the table.

d. Specify the degree to which fish passage will be provided under various flow conditions (species and size ranges for sport and non-sport fish) and develop a monitoring plan to determine effectiveness of fish passage to assess the extent to which the dam is a barrier to fish passage. Include frequency, time of year, and techniques used to monitor.

71. Supplemental Information Request 1, Question 347a, Page 5.234
Volume 3A, Section 8.4.4.2, Page 8.58

Alberta Transportation provided a brief quantification of fish habitat primarily based on a brief survey and a desktop exercise. This question has not been answered sufficiently. Alberta Transportation needs to conduct habitat assessment and mapping to determine baseline habitat downstream of the dam site. Changes may be modelled and offsetting needs to be determined.

a. Identify plans to offset losses in the productivity of the fish habitat identified.

72. Supplemental Information Request 1, Question 348a, Pages 5.235-5.236
Volume 3B, Section 8.2.2, Page 8.6
Volume 3B, Section 8.2.2.3, Page 8.10
Volume 3B, Section 6.4.4.1, Table 6-10, Page 6.54
Volume 3B, Section 6.4.4.3, Figures 6.29-6.31, Pages 6.63-6.65

Alberta Transportation states that the impact to fish from the slow release of sediment-laden (potentially high temperature and poor quality water) water from the dam into the side channel and the Elbow River would not be anticipated to result in residual effects on aquatic ecology.

This question has not been answered sufficiently. There appears to be a determination that the release of water from the reservoir that is potentially of poor quality and higher temperatures will not be harmful to fish. This is likely incorrect.

a. Provide a follow-up monitoring plan to identify potential impacts to fish. Describe the surveys/reports that are to be used.

b. Assess water quality conditions that could occur in the dam when in use. Reference those water quality conditions to the potential impacts to fish:
   i. in the dam reservoir area; and
   ii. potential change in water quality in the Elbow River due to dam water releases.

c. Discuss the impacts to fish resulting from the slow rate of release of turbid water over an extended period of time. Consider the severity of ill effects (SEV) dose-response curve which indicates elevated negative impacts to fish with increasing duration of high sediment events.

d. What are the impacts to fish due to the operation of the auxiliary spillway?

73. Supplemental Information Request 1, Question 349, Page 5.241-5.242

Alberta Transportation states that flows over 160 m^3/s are considered channel forming.

Since the Elbow River routinely experiences flows >160m^3/s altering and/or suppressing the flow regime would affect the quality and quantity of fish habitat downstream in the long term. Prevention of bedload movement would result in the permanent loss and alteration of fish habitat. The alterations that occur include the increasing embeddedness of bed material and increased siltation. This change in substrate would reduce the availability of fish habitat, spawning habitat, and reduce the productivity of the river (i.e. invertebrate communities) which would subsequently impact fish populations.

Operation of the dam will alter channel forming flows downstream of the project site. This includes changes to (reduction) the movement of bed materials and outright loss of woody debris.

a. Map fish habitat downstream of the diversion structure. In addition, conduct an assessment of how habitat would decline over time.

b. What evidence is being cited to conclude that flows over 160 m^3/s are considered channel forming and would shift bed materials to maintain habitat?

c. Is the proposed flow level adequate to maintain riverine processes?

d. Assess the changes to the reduction of movement of bed materials and loss of woody debris. In addition, assess the subsequent impacts to fish habitat over time resulting from dam operation.

e. Map fish habitat upstream and downstream of the diversion structure to provide baseline information for comparison when assessing post dam operations.

74. Supplemental Information Request 1, Question 350, Pages 5.245-5.248

Alberta Transportation states that fish entrainment could be up to 80%, but would likely be lower.

This question has not been answered sufficiently. Fish could be entrained at a higher rate than discussed, and the entrainment rate is not necessarily linear. Alternative rates of entrainment should be considered in regard to potential population level effects due to potential losses resulting from mortality, and also from physical impacts to fish when diverted (i.e. injury, diminished reproductive capacity).

a. Explain the modeling of fish entrainment (up to 80%). Is there experimental data which supports linear rates of entrainment relative to flow?

75. Supplemental Information Request 1, Question 351, Pages 5.248-5.250
Volume 3B, Section 8.2.4.3, Page 8.17
Volume 3B, Section 6.4.3.1, Table 6-6, Page 6.2B

Alberta Transportation predicts that effects on fish would not meet the threshold that is considered serious harm to fish because fish rescues would be conducted to remove any stranded fish, eliminating mortality.

In general, rescuing stranded fish from pools in reservoirs is expensive, ineffective, and sometimes cannot be undertaken due to risks to human safety (i.e. inaccessibility due to mud). There are assumptions that very few or no fish will be stranded and that fish rescue is safe, feasible, and effective. Neither of these assumptions are likely correct based upon experience (i.e. periodic fish stranding in the Ghost Reservoir).

In addition, the response provided has not been answered sufficiently. It does not address potential harm to fish due to timing of sediment release, nor does it consider the effect of the sediment on entrained fish. It also does not address the potential impacts of failure to rescue stranded fish, which is not something considered in the document (but which commonly occurs in other dams during draining for maintenance work, i.e. fish cannot be reached safely to rescue them, and perish).

a. Explain how this mortality risk can be classified as not significant given that mitigation relies on locating and rescuing an unknown number of fish by hand with an unspecified work force capacity working in a short time window during which reservoir water quality and capacity will support fish.
b. Estimate the mortality of fish due to dam operations, and evaluate the potential population level effects of this mortality.
c. Develop a mitigation plan to address mortality from stranding.
d. Develop a monitoring plan to assess the impact of dam operations on fisheries populations.

76. Supplemental Information Request 1, Question 353a, Page 5.257

Alberta Transportation states that monitoring would be conducted from shore.

This question has not been answered sufficiently and does not address what will happen if there are problems with operations or during periods when flows are low, or if v-weirs sustain damage and need maintenance.

a. Describe and explain what monitoring of fish passage will entail including frequency, time of year, and techniques.
b. Develop mitigation plans focused on the potential failure of fish passage.

77. Supplemental Information Request 1, Question 354, Pages 5.259-5.260

Alberta Transportation states that monitoring would be conducted from shore.

This question has not been answered sufficiently. Monitoring fish from shore will not identify signs of stress, injury, or mortality.

a. Describe monitoring at the low level outlet and in the reservoir to identify signs of stress.

b. Develop a monitoring plan for the monitoring of fish conditions for the fish returning to the Elbow River using methods acceptable in fisheries science.

c. Will any monitoring be undertaken in the Elbow River to ascertain whether fish swimming out of the reservoir are exhibiting signs of stress or mortality after returning to the flowing watercourse? If monitoring is to be undertaken describe the monitoring plan that will be in place. If no monitoring is to be undertaken justify and explain the rationale behind not monitoring fish in the Elbow River to determine if fish are exhibiting signs of stress or mortality after returning to the flowing watercourse.

78. Supplemental Information Request 1, Question 356a, Page 5.261

Alberta Transportation states that the impacts of dam construction would be minimal in regard to affecting fish habitat.

This question has not been answered sufficiently as it does not account for potential negative impacts to fish movement or fish habitat during dam construction and operation.

a. Provide an update to the summary table which shows the full range of magnitude for potential effects of the dam on fish habitat.

b. Describe what mitigation measures will be implemented to minimize impacts to habitat and fish movement during construction. The mitigation measures should take into account the construction activities and duration.

79. Supplemental Information Request 1, Question 357a, Page 5.279

Alberta Transportation responded that bull trout spawn in the area upstream of Bragg Creek (Applied Aquatic Research 2008).

This question has not been answered sufficiently. There is evidence that bull trout migrate past the proposed dam location and inhabit the section below the dam, including spawning downstream (R. Popowich and A. Paul, 2006).

a. Map existing critical or sensitive areas used by bull trout including migration and spawning routes.

5 Terrestrial

5.1 Terrain and Soils

80. Supplemental Information Request 1, Question 374d, Page 6.33
Supplemental Information Request 1, Question 375c, Page 6.37
Supplemental Information Request 1, Question 376c, Page 6.39
Supplemental Information Request 1, Question 377c, Page 6.40
Supplemental Information Request 1, Question 378c, Page 6.43
Supplemental Information Request 1, Question 384d, Page 6.62

Supplemental Information Request 1, Question 385b, Page 6.63
Supplemental Information Request 1, Question 385d, Page 6.75
Alberta Transportation states in response to a number of different SIRs that *the soil analytical results of the screen soil...will be compared to the applicable guidelines*, but Alberta Transportation does not identify those guidelines.

a. Confirm that the soil data analyzed from all areas of potential environmental concern will be compared to "Alberta Tier 1 Soil and Groundwater Remediation Guidelines" (Alberta Environment and Parks, 2019, as amended) or "Alberta Tier 2 Soil and Groundwater Remediation Guidelines" (Alberta Environment and Parks, 2019, as amended).

81. Supplemental Information Request 1, Question 382a and Question 382c, Page 6.55
Alberta Transportation states that *removal of sediment from the reservoir to another off-site location is not planned*, but Alberta Transportation does not describe conditions where sediment removal or cleanup would be necessary.

a. Respond to the original SIR1 question 382c, by describing all potential conditions over the lifespan of the reservoir where sediment removal or partial removal would become necessary, regardless of whether it is planned or unplanned.

82. Supplemental Information Request 1, Question 383g, Page 6.56
Volume 1, Section 4.5, Table 4-1, Page 4.2
Alberta Transportation did not define "appropriate facility" as stated in Table 4-1.

a. Respond to the original SIR1 question 383g to define appropriate facility.

83. Supplemental Information Request 1, Question 385a, Page 6.63
Volume 3A, Section 9.2.4, Page 9.25

a. Respond to the original SIR1 question 385a and provide a map at a 1:5000 scale or finer resolution for the ZREC unit. The decision not to undertake higher resolution mapping due to the small size of the ZREC unit is not reasonable. Detailed mapping is required because Figure 9-5 (Volume 3A, page 9.25) does not clearly depict the location of the ZREC unit.

84. Supplemental Information Request 1, Question 388b, Page 6.83

a. Respond to the original SIR1 question 388b to describe mitigation measures related to potentially contaminated sediment.

85. Supplemental Information Request 1, Question 394c, Page 6.95

a. Respond to the original SIR1 question 394c to address how post-flood sediments will be monitored for potential contaminants of concern, even if the intent is that they will be left in place.

86. Supplemental Information Request 1, Question 407, Page 6.118
Supplemental Information Request 1, Appendix IR407-1, Section 7.3, Page 7.4
Alberta Transportation states: *Topsoil, and where applicable, subsoil that has been salvaged and stockpiled during construction will be replaced on the site **prior** to decompaction.*

a. Was the intent to decompact the site before replacement of the topsoil and subsoil on the surface? Explain.

5.2 Vegetation

87. Supplemental Information Request 1, Question 401, Page 6.105
Supplemental Information Request 1, Appendix IR2-1, Page 2
Volume 1, Section 1.3.2.1, Figure 1-8, Pages 1.12, 1.13
In the Supplemental Information Request responses regarding future land use of the Springbank off-stream Reservoir Project, Alberta Transportation has revised their comments from the original Environmental Impact Assessment to now state *In general, only uses and activities that have a minimal impact on the land will be allowed. Therefore, the availability of surface dispositions will be limited.*

Certain agricultural dispositions, approvals, or authorizations, such as grazing leases, grazing licenses, grazing permits, head tax grazing permits, farm development leases, cultivation permits, and hay permits exist and are utilized by Alberta Environment and Parks to provide the opportunity for agricultural activity while at the same time making provisions for conditional and/or unrestricted access to the lands for exercise of First Nations treaty rights such as hunting.

a. Given the presence of such dispositions, approvals, or authorizations, has Alberta Transportation considered these possible tools as an opportunity to continue to enable agricultural use of lands within Area C or Area B of the Project area during periods when there is no risk of interfering with the Primary Use of the project area for flood mitigation? Explain why or why not.

b. Has Alberta Transportation considered the possible benefits in the use of certain agricultural dispositions, approvals, or authorizations as a mitigation measure in managing both potential fire hazard from unutilized vegetative biomass and to avoid the potential creation of favourable microsites for noxious weed colonization commonly associated with the non-use of vegetative biomass production over extended periods? Explain why or why not.

88. Supplemental Information Request 1, Question 407, Page 6.118
Supplemental Information Request 1, Appendix IR407-1, Page 7.2
Regarding seed mix selection for native areas, Alberta Transportation states pinegrass (Calamagrostis rubescens) and hairy wild rye (Leymus innovates) may be used as substitutes for species listed in the original species mix.

a. Given these two species are most commonly found in forested areas or on forest margins will they only be used in similar habitats for reclamation efforts or is the intent to utilize these species on areas where the site potential is open native grassland as well? Explain.

89. Supplemental Information Request 1, Question 407, Page 6.118
Supplemental Information Request 1, Appendix IR407-1, Page 7.1

For revegetation efforts Alberta Transportation states a target of noxious weed abundance as being *equivalent or lower than surrounding undisturbed areas and do not account for more than 25% of the total vegetation cover*.

The *Weed Control Act* states that a person shall control a noxious weed that is on land the person owns or occupies and that a person shall destroy a prohibited noxious weed that is on land the person owns or occupies.

a. Given a noxious weed cover of 25% is significant and may incur the potential of receiving a weed notice from the weed inspector is such a threshold target suitable? Explain.

5.3 Wildlife

90. Supplemental Information Request 1, Question 408, Page 6.1119
Supplemental Information Request 1, Figure IR408-1, Page 6.121

The Elbow River valley serves as a key wildlife and biodiversity zone (KWBZ) which is an important movement habitat for numerous wildlife species. It was identified during a meeting between AEP and Alberta Transportation, as part of the SIR review in 2019 that numerous wildlife collisions have been observed at the bridge.

a. Explain why this area was not included in the EIA as a possible or potential wildlife collision prone location (Figure IR408-1).

91. Supplemental Information Request 1, Question 409, Page 6.122

Montane elk study research publications were available at the time this EIA was written. These research publications could have been used to describe estimates of habitat use and avoidance as a result of human and vehicular access. These publications were not used in the EIA references (Authors Paton, Ciuti, Boyce, Muhly) for elk and grizzly bear (http://www.biology.ualberta.ca/www.montaneelk.com/updates.php).

a. Explain why the research publications of montane elk were not used in the EIA to inform expected impacts due to human and vehicular use.

92. Supplemental Information Request 1, Question 409, Page 6.122
Supplemental Information Request 1, Question 410, Page 6.123
Supplemental Information Request 1, Figure IR411-2, Page 6.128

a. Explain and clarify if the Wildlife Crossing Structures Handbook specifications will be adhered to for the crossing structure/culvert on highway 22 (Figure IR411-2 pg 6.128). If not, explain why these specifications will not be adhered to and the adequacy of the proposed design. https://roadecology.ucdavis.edu/files/content/projects/DOT-FHWA_Wildlife_Crossing_Structures_Handbook.pdf.

b. The current fencing in place for this culvert is designed for cattle and prevents most ungulate wildlife crossings. Will this fencing be modified to enable wildlife movement? If not, then explain why no modifications will be made.

93. Supplemental Information Request 1, Question 412, Page 6.129
This question has not been answered sufficiently.

a. Explain in additional detail how and/or if wildlife crossing deterrent fencing will be used to guide animals to preferred crossing areas. Provide a map explaining where the project expects ungulate movement to be negatively impacted.

b. Explain how an increase in expected or unexpected vehicle wildlife collisions will be mitigated in the future.

c. Will adjoining land fencing also facilitate this intended movement? Explain why or why not.

94. Supplemental Information Request 1, Question 413, Page 6.130
Many other types of wildlife friendly fence designs are available.

a. Explain if gates, jump rails or drop sections of fences have been considered.

b. Explain if gates, jump rails or drop sections of fences will be used to further enhance ungulate movement at all times and/or at times when livestock are not required to be contained (in the event livestock use is permitted) in both internal and external project fences.

c. If gates, jump rails or drop sections of fences have not been considered, explain why not.

95. Supplemental Information Request 1, Question 414, Page 6.132
Supplemental Information Request 1, Question 410c, Page 6.124
The response states the qualitative approach taken is sufficient and standard. However, this approach has created uncertainty on project effects to wildlife movement.

a. Explain how an enhanced assessment and monitoring design could have been utilized to better understand the impacts of the project. Explain why this approach was not taken.

96. Supplemental Information Request 1, Question 415, Page 6.134
Volume 3A, Section 11.2.2.4, Page 11.28
Alberta Transportation states *the frequency of grizzly bear use is expected to be low based on the information presented in Volume 3A, Section 11.2.2.4, page 11.28, which indicates the wildlife LAA provides relatively low suitability habitat*.

a. Explain how a major riparian watercourse movement corridor and KWBZ with native prairie uplands and abundant big game populations can be considered low suitability habitat for grizzly bear considering this habitat is known to support numerous adult and young grizzly bears and is adjacent to the draft recovery plan's identified support zone.

97. Supplemental Information Request 1, Question 417, Page 6.316
The response has not included any impact assessment of on-foot human access to the site.

a. Explicitly describe and explain how foot or water-based access and recreation facilities will affect wildlife use, conflicts, and mortality.

98. Supplemental Information Request 1, Question 418, Page 6.316

a. The term nuisance animal is not in the Alberta Wildlife Regulation and is a term used by the *Agricultural Pests Act* and regulations. Correct the response so that the correct regulation is referenced.

b. Explain how this term has been used in this section and the terminology around nuisance animal.

It is noted in the response to this question that the proponent has not obtained all information available, nor gathered additional information with which to enable prediction of human wildlife conflicts.

c. Explain the ability to predict these conflicts with the limited information provided and explain if this deficiency will be addressed. If this deficiency will not be addressed, explain why.

d. Confirm that the GOA is the authority and will take appropriate action as per established conflict wildlife policies and protocols where responsible.

e. Confirm that Alberta Transportation understands that all occupied dens are protected under the *Wildlife Act* and Regulation.

99. Supplemental Information Request 1, Question 419, Page 6.139

Native elk habitat is of much greater value than modified habitat.

a. Explain why native habitat will be replaced by modified habitats instead of being restored.

b. Explain the loss in habitat value that will occur as a result and provide a detailed map where this loss is expected. Note: the current descriptions are deficient.

c. Explain why Alberta Transportation is proposing actions that will degrade habitat and not proposing to restore these losses.

100. Supplemental Information Request 1, Question 420, Page 6.140
Volume 3A, Section 11.4.2.3, Page 11.46

Alberta Transportation states *However, crop and hayland are expected to become tame pasture over time, which provides suitable wildlife habitat for grassland-dependent species*. Tame pasture habitat types have an extremely low habitat value relative to native plant communities for most wildlife species.

a. Explain the statement and assessment of "suitable" as referenced above when it is expected that the conversion of habitat will have significant adverse impacts (see Volume 3A, Section 11.4.2.3, Page 11.46).

b. In addition, explain the basis for this assumption and identify where habitat value losses are expected. Support this explanation with a detailed map.

c. Explain why restoration of private crop and hay land to native prairie as a conservation measure was not proposed to offset native habitat that will be adversely affected by this project.

101. Supplemental Information Request 1, Question 421, Page 6.412

This response contradicts other sections of the EIA which acknowledge that sedimentation will destroy native communities and will require sediment removal and reseeding which cannot replace native grasslands.

Native seeding may not restore native grasslands and the statements made in reference to this may be misleading and misrepresenting regarding the assumed impacts to native habitat, habitat loss and replacement estimates.

a. Explain why Alberta Transportation does not acknowledge this loss and long term reduction in habitat values when native habitat is disturbed.

b. Explain if it is possible to increase the native grassland by 90.6 ha during dry operations if it is expected that some of this area will be modified, and cannot be restored, or may take decades to recover.

c. Explain these assumptions and clarify and correct the contradicting statements in the EIA.

d. Confirm that the methods used do not establish the confidence or ability to predict impacts. Explain why Alberta Transportation chose to limit its ability to inform this assessment.

102. Supplemental Information Request 1, Question 422, Page 6.144

The response indicates that reestablishment of habitat will take 10 years or longer. This long term impact has not been discussed in the EIA.

a. Explain the reduction in habitat values that are expected to persist >=10, 20, >50 years or longer. Provide a map to illustrate these areas in detail.

103. Supplemental Information Request 1, Question 423, Page 6.145

Alberta Transportation states *Long-term changes in habitat conditions, such as scouring, plant cover, woody debris, supporting habitat functions (e.g., food sources, shelter), and health in downstream habitat are therefore also not expected to change in a meaningful way*.

a. Explain how limiting the Elbow River flow downstream of the diversion structure to 160m^3/s will influence riparian habitat health downstream of the diversion channel to the Glenmore Reservoir and beyond.

b. Provide a map of the riparian habitat expected to receive and not receive overland flooding at 160, 200, 250, and 300 m^3 flow rates. Explain how this modification of flow will affect the riparian health and function of affected wildlife habitat downstream of the project area to the distance expected to be influenced.

c. Explain in detail how something can change but not in a meaningful way. Define the term “meaningful” in both relative and absolute terms and provide examples to illustrate this as it relates to the question.

104. Supplemental Information Request 1, Question 426, Page 6.147

Alberta Transportation states that *the draft wildlife mitigation and monitoring plan…for construction and dry operations focuses on large mammals (e.g., deer, elk, grizzly bear) because they are species of management concern (SOMC) that are most likely to be affected by the Project through changes in movement and have the greatest uncertainty regarding responses to Project components.*

a. Explain how they have the greatest uncertainty and identify why these uncertainties remain.

b. How can these uncertainties be addressed via the post construction-monitoring plan?

105. Supplemental Information Request 1, Question 427, Page 6.148

Alberta Transportation states *Given these mitigation measures, the Project will have no significant effects on wildlife habitat, movement, and mortality risk, and will not threaten the long-term persistence or viability of wildlife in the wildlife RAA. Based on this, no further mitigation for biodiversity is required.*

a. Explain the additional benefit if all disturbed habitats were restored to native habitat and conservation tools such as offset measures on adjacent lands were used.

b. Explain how unforeseen protected wildlife and/or habitat features will be dealt with if they are detected (e.g. nests or dens)?

c. Explain if an assessment of impact on wildlife values was completed for non-dam related post construction end land uses (e.g. recreation and access). If not, explain why not.

106. Supplemental Information Request 1, Question 428, Page 6.153

a. Explain and assess the adequacy and inadequacies of the proposed post construction-monitoring plan.

b. Explain if the timelines and methods proposed will enable clearly stated monitoring objectives to yield robust conclusions as per the last statement of this SIR response.

c. How does the proposed methods align with respect to similar monitoring programs effectiveness and designs used in other EIAs and wildlife mitigation and monitoring programs in Alberta?

107. Supplemental Information Request 1, Question 429, Page 6.155

The project should adhere to Environment and Climate Change Canada's (ECCC) habitat clearing recommendations for sediment removal during nesting periods, and be in accordance with the *Migratory Bird Convention Act.*

a. Confirm that clarity will be the obtained from the ECCC regarding the habitat clearing guideline.

108. Supplemental Information Request 1, Question 432, Page 6.189
Restoration of native habitat is very difficult and it is noted that the term reclamation is not equivalent to restoration.

a. Explain and assess if the stated conclusions on habitat modification impacts are underestimated to a degree that they cannot be informed via the assessment methods contained in the EIA.

109. Supplemental Information Request 1, Question 434, Page 6.192
The response provided does not comply with the *Wildlife Act* and Regulation, which protects some of the habitat features identified. Preconstruction surveys will be critical to preventing destruction or disturbance of these protected species and habitat features.

a. Explain how Alberta Transportation will comply with the *Wildlife Act* and Regulation.

110. Supplemental Information Request 1, Question 435, Page 6.193
Frequent grizzly bear use has been confirmed along the Elbow River and surrounding habitat within the PDA, LAA, and RAA. This is important habitat for many species consistent with the associated KWBZ. The original SIR has not been answered and the methods used in the assessment as referenced in the response are also limited.

a. Why were impacts to movement and risk not further assessed or discussed?

b. Explain the rationale for adequacy of the assessment methods on grizzly movements along the Elbow River valley.

c. Does Alberta Transportation have confidence in their ability to understand impacts of the project on grizzly use and movement along the Elbow River? Explain.

6 Health

111. Supplemental Information Request 1, Question 206, Page 4.4
Supplemental Information Request 1, Figure IR206-1, Page 4.4
Supplemental Information Request 1, Question 444, Pages 7.26-7.37
Supplemental Information Request 1, Figure IR444-2, Page 7.29
Supplemental Information Request 1, Figure IR444-3, Page 7.30
Volume 3A, Section 15.4.1, Tables 15-12, 15-13, 15-14, Pages 15-45 to 15-53
Alberta Transport states *During construction, activities between the diversion channel and the dam, there will be 24-hour continuous wind and air quality monitoring for $PM_{2.5}$ and TSP at Stations 1 and 2 along the haul road and at Station 3 near the borrow source area as illustrated on Figure IR206-1. The proposed locations of the air quality monitoring stations were selected based on modelling results*.

The results of the HHRA indicate the predicted air concentration exceeds the acceptable criteria at SR41 and SR19. Both locations are representative of permanent residences and close to other residences. The proposed monitoring stations are not in the vicinity of these locations.

a. Describe a monitoring program inclusive of the SR41 and SR19 locations.

112. Supplemental Information Request 1, Question 448, Page 7.44
Volume 3A, Section 15.4.1.4, Page 15.39
Volume 3B, Section 15.4.1.4, Page 15.18
Volume 4, Appendix O

The conclusions of the HHRA are dependent on the predicted air dispersion modelling results. Through the SIR process, additional air modelling may be required for the air quality portions of the application thus generating new predicted air concentration data.

a. In the event that new or additional air dispersion data is generated for selected Chemicals of Potential Concern (COPC), compare the results to health-based Toxicological Reference Values (TRVs) and discuss the potential health impact or provide justification for not completing these steps.

7 Errata

113. Supplemental Information Request 1, Question 206, Table IR206-1, Page 4.4

Alberta Transportation states the 24-hour Alberta Ambient Air Quality Objective (AEP 2019) for Fine Particulate Matter ($PM_{2.5}$) as 30 µg/m^3 in Table IR206-1. This is incorrect. The 24-hour AAAQO for Fine Particulate Matter ($PM_{2.5}$) is 29 µg/m^3.

a. Correct Table IR206-1 so that the correct value is referenced.